

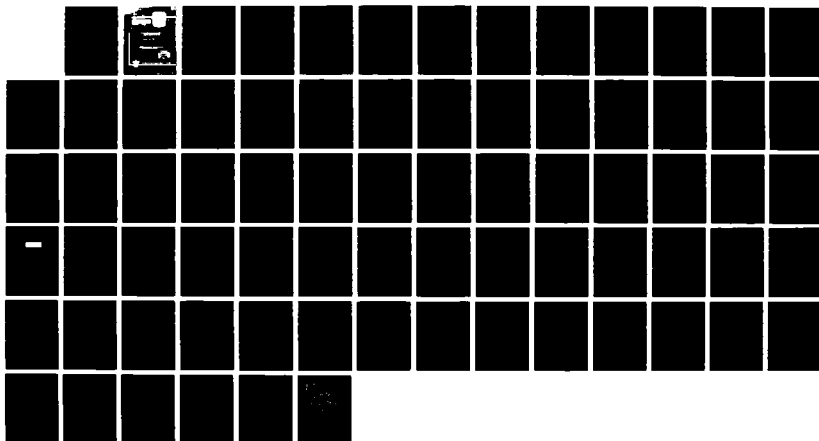
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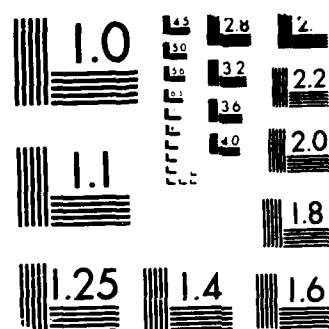
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LIEUTENANT COLONEL ROBERT F. KERRY, JR.

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USAWC MILITARY STUDIES PROGRAM PAPER

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BATTLE ENVIRONMENT ASSESSMENT FOR COMMANDERS:
A CONCEPT OF SUPPORT FOR JOINT AND COMPONENT STRATEGY AND OPERATIONS

AN INDIVIDUAL STUDY PROJECT

by

Lieutenant Colonel Robert F. Kirby, EN

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Project Adviser

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ABSTRACT

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Battle is conducted in physical geographic zones traditionally defined by land, sea, air, and more recently including space. The modern theater commander must understand a complex battle environment which merges these zones through the synergism of dynamic weapon systems and joint operations. The successful military commander will study and anticipate his theater of operations. The process which provides commanders with the physical conditions of battle has evolved with the complexity of warfare. The broad study of military geography has found various interpretations in strategy and operations. Each evolution has adapted to specific needs. The broad scope of theater operations at the strategic and operational levels of war argues for the integration of the various physical battle zones into an integrated battle environment assessment. Technology is evolving to provide this integration. Limited personnel and materiel resources are forging a unification of effort among the myriad of environmental information providers and users. This paper asks the question: What can be done to give future commanders an assessment of the battle environment? It looks at an evolutionary spectrum of geographically based needs for commanders who conduct military operations at the strategic and operational levels of war. It then considers the current and developing joint and service organizational methods and some of the technologies which provide environmental data and analysis to address these needs. Unsatisfied or unanticipated needs are raised as problems. The proposed solutions to these problems encompass a conceptual approach through the Battle Environment Assessment, a management approach for joint policy and direction, an organizational approach through a joint environmental agency, and integration of military environmental capabilities.

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BATTLE ENVIRONMENT ASSESSMENT FOR COMMANDERS:
A CONCEPT OF SUPPORT FOR JOINT AND COMPONENT STRATEGY AND OPERATIONS

CHAPTER I

INTRODUCTION:
WHAT CAN BE DONE TO GIVE FUTURE COMMANDERS
AN ASSESSMENT OF THE BATTLE ENVIRONMENT?

If a general desires to be a successful actor in the great drama of war, his first duty is to study carefully the theater of operations so that he may see clearly the relative advantages and disadvantages it presents for himself and his enemies. ¹ Jomini

Battle is conducted in physical geographic zones traditionally defined by land, sea, air, and more recently including space. As proposed by Jomini, the successful military commander will study and anticipate his theater of operations. The modern theater commander must understand a complex battle environment which merges these zones through the synergism of dynamic weapon systems and joint operations.

The process which provides commanders with the physical conditions of battle has evolved with the complexity of warfare. The broad study of military geography has found various interpretations in maritime and continental strategies, engineer intelligence, strategic geographic appraisal, and more

recently, Intelligence Preparation of the Battlefield and terrain analysis. Each evolution has adapted to specific needs.

The broad scope of theater operations at the strategic and operational levels of war argues for the integration of the various physical battle zones into an integrated battle environment assessment. Technology is evolving to provide this integration. Limited personnel and materiel resources are forging a unification of effort among the myriad of environmental information providers and users.

This paper will look at an evolutionary spectrum of geographically based needs for commanders who conduct military operations at the strategic and operational levels of war. It will then consider the current and developing joint and service organizational methods and some of the technologies which will provide environmental data and analysis to address these needs. Unsatisfied or unanticipated needs are raised as problems. The proposed solutions to these problems encompass a conceptual approach through the Battle Environment Assessment, a management approach for joint policy and direction, an organizational approach through a joint environmental agency, and integration of military environmental capabilities.

ENDNOTE

1. J. D. Hittle, "Jomini and His Summary of the Art of War," in Military Strategy: Theory and Application, ed. by COL Arthur F. Lykke Jr. , p. 106.

CHAPTER II

WHAT DO COMMANDERS NEED TO KNOW ABOUT THE BATTLE ENVIRONMENT?

Both on sea and land it would often save leaders from a fatal error of "doing something" if they said to themselves before they drew the plan of operations to acquire a particular spot, "How can the enemy neutralize its loss? What shall I do with it when I have obtained it? What shall my next step be? The fame and moral effect of my achievement may do something morally if any revered traditions are at stake; but, putting sentiment on one side, what use will it be in a military sense?"¹ Col. E. S. May, British Army, 1906

A commander's view of the battle environment will depend on factors like the level of interest (strategic, operational, or tactical), breadth of the area of interest, and the forces at his command. This chapter will develop a common base of needs at the strategic and operational levels of war as a frame of reference for later analysis on how those needs are being satisfied. It will begin by reviewing the strategic concepts of military geography and geopolitics found in the historical writings of Mahan, Mackinder, Spykman, and Seversky. The modern outgrowth of these concepts is found in the development of the Navy's Maritime Strategy, the Army's AirLand Battle, and a theater commander's area or regional assessment in his campaign plan. At an operational level, the writings of Jomini

and Clausewitz add more detail, and support the development of an Intelligence Preparation of the Battlefield for the operational level of war. It must be emphasized that mere data of physical geography - position, topography, resources, population, climate - have no intrinsic political or military significance. Such data acquire military or political significance only when related to some frame of assumption as to what is to be attempted by whom, when, where, and in conjunction with what adversaries, allies, and neutrals.² To be of any value, the data must be communicated in a timely manner, and in a form which supports the decision; this has been connected to technology. The synthesis of these ideas will provide what the commander needs to know.

BACKGROUND

Modern western military strategy has drawn from Mahan (maritime), Mackinder (continental), Spykman (rimland), and Seversky and Douhet (air) in order to describe the character of a particular battle environment. These global views defined geopolitical potential in terms of objectives, position, and technology. They each place a single physical geographic zone - land, sea, or air - in the dominate and decisive battle environment role. The fixation with one strategic, physical geographic zone represses the potential for environmental synergism among them all.

Jomini and Clausewitz offer environmental views at the strategic and operational levels of war. Jomini cautions commanders by explaining that "The most important ... features which make up the theater of a war ... will depend much upon the spirit and skill of the general" ³ and that "The theater of war comprises all the territory (ground and sea) upon which the parties may assail each other..." ⁴ Speaking of military genius, Clausewitz says, "A commander-in-chief ... must aim at acquiring an overall knowledge of the configuration of a province, of an entire country." ⁵ His sense of place. He further explains that terrain, the time of day, and weather are "constant factors in any engagement that will affect it ...", ⁶ and uses the geographic character of the theater of war as a primary element when developing the enemy center of gravity. ⁷

THE NEEDS

According to joint policy , geographic area is the most commonly used basis in the organization of a command, determining its size, and nature of assigned forces, and the extent of authority exercised by the commander so that he may implement the strategic plans and guidance. ⁸ In presenting the impact of military geography, Peltier and Percy explain, " The characteristics of the areas

of theaters of operations influence the organization, equipment, training, and logistics requirements of the forces in these theaters and thus they influence the feasibility of different military strategies." ⁹

Current strategic force commanders need to exploit geographic environmental synergism when developing national military strategies. United States strategic policies for nuclear and conventional forces and the Strategic Defense Initiative are soundly based on exploiting the integration of physical geographic zones. The strategic nuclear triad comprises land and sea based missiles, and manned aircraft. ¹⁰ The conventional Maritime Strategy promotes the total naval, air, and amphibious force by effectively integrating "... all elements of United States military power in the maritime arena in order to make the greatest possible contribution to the unified commander's mission." ¹¹ AirLand Battle doctrine "... takes an enlarged view of the battlefield, stressing unified air, ground, and sea operations throughout the theater." ¹² Air Force doctrine considers the "aerospace environment" as "... the multidimensional operating environment where Air Forces can perform all of their missions." ¹³ The Strategic Defense Initiative broadens the integration of space based reconnaissance, navigation, meteorologic, and communications support, and transiting missiles, to provide a defensive balance to the offensive nuclear triad and conventional forces.

In summary, commanders need a conceptual frame of reference for integrated battle environment analysis. Presentation of diverse geographic environmental elements such as oceanography, topography, hydrology, climatology, meteorology, geodesy, and astronomy need to be relevant to the commander's decision making process. While these elements have discrete effects on the development and prosecution of theater strategy and operations, their interrelationships have the greater, holistic effect on the dynamics of integrated land - air - sea -space forces.

The commander also needs a responsive system to acquire, process, analyze, disseminate, and revise environmental information. The system must take full advantage of the range of data collectors and users within his theater, and those outside the theater in either support or national decision levels. The characteristics should be a hierarchical, interactive, timely decision aid, which is accessible, and interoperable.

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CHAPTER III

WHAT IS BEING PROVIDED AND HOW?

Now the elements of the art of war are first measurement of space; second estimation of quantities; third calculations; fourth comparisons and fifth chances of victory. ¹

Sun Tzu

This chapter will explore the scope of environmental services and those who provide them as presented in joint and military service literature and programs. It will present current primary organizations, procedures, and technologies, and then review some of the changes being implemented or considered

ENVIRONMENTAL SERVICES OVERVIEW

"Environmental Services" is defined in the Joint Chiefs of Staff Dictionary of Military and Associated Terms as:

The various combinations of scientific, technical, and advisory activities (including modification processes, i.e., the influence of man-made and natural factors) required to acquire, produce, and supply information on the past, present, and future states of space, atmospheric, oceanic, and terrestrial surroundings for

use in military planning and decision-making processes, or to modify those surroundings to enhance military operations." ²

While this definition seems inclusive of all environmental zones, in practice it is confined to meteorological, oceanographic, and space environmental factors, excluding topographic factors and the related services of mapping, charting, and geodesy.

The Joint Chiefs of Staff Unified Action of the Armed Forces sets out the primary environmental services and responsibilities including mapping, charting, and geodesy. These aspects are summarized here, with the details extracted at Appendix 2.

METEOROLOGICAL, OCEANOGRAPHIC, AND SPACE ENVIRONMENTAL FACTORS

In joint operations, the meteorological, oceanographic, and space environmental requirements will evolve from the nature of the operation, kinds of forces involved, and command directives. The support responsibilities extend from the National Oceanic and Atmospheric Administration (which alone or in concert with foreign national services operates the basic observation and analysis network), through functional agencies of the military services (the Air Force's Air Weather Service for meteorologic support to the Air Force and Army, and the Navy's Naval Oceanography Command for meteorological support to the

Navy and for oceanographic support to all elements of the Department of Defense), to the forward combat elements (the Army and Marines provide their own meteorologic support forward of division headquarters). Depending on their operational focus, the unified and specified CINCs get meteorological support from either the Air Force or the Navy. The Air Force provides space environmental support. ³

MAPPING, CHARTING, AND GEODESY

Mapping, charting, and geodesy (MC&G) services include: the depiction of cartographic, hydrographic, aeronautical, atmospheric, and oceanic data; geodetic positioning; and the cartographic aspects of area analysis intelligence production. The Defense Mapping Agency provides the standard MC&G products and services, and gives program management and coordination to service and joint command MC&G activities. ⁴

JOINT ACTIVITIES

There is an environmental services division within joint staffs from the Joint Staff (OJCS) through the joint staffs of unified and specified commands. The environmental staff is found in either operations (J3) when the focus is

environmental support, or in intelligence (J2) when the focus is targeting. It usually includes the disciplines of oceanography, meteorology, and mapping, charting, and geodesy, and has multi-service representation. Each discipline provides their independent analysis and review of planning documents such as Annex H (Environmental Services), and Annex M (MC&G) to Joint Plans. Appendix 3 to this report gives the mission and functions of the Joint Staff's Environmental Services Division.⁵ A liaison officer from the Defense Mapping Agency is detailed to the Joint Staff to coordinate MC&G.

The Joint Staff is functionally supported by the Military Service staffs, which focus on their particular battle environment, land, sea, air, or space. These service staffs and capabilities support a single service commander at the operational level of war, and will be discussed separately by service.

The commander-in-chief uses the campaign plan as his primary frame of reference for environmental considerations.⁶ The assessment of the area of operations in the estimate of the situation gives a traditional geographic approach. An extract of the Army's proposed "Campaign Plan" is provided at Appendix 4

The commander-in-chief has a variety of environmental information systems at his disposal. Mainly they include: space-deployed navigation,

meteorological, geodetic, and reconnaissance assets; regional appraisals by the Defense Intelligence Agency; MC&G products in the DMA Area Requirements and Product Status System ⁷; climatology in the World-Wide Military Command and Control System (WWMCCS) Environmental Support System (WESS) ⁸; and the integration of terrain and weather in the Joint Tactical Fusion program (although this is focused at the tactical level, an Army corps may apply the process at the operational level when part of a joint task force) ⁹.

THE ARMY

The Army gives general staff oversight of environmentally related disciplines (topography and weather) to intelligence. The engineer has special staff and operational responsibility for topography, hydrology, and environmental sciences, less meteorology which remains with intelligence, but is supported by the Air Force's Air Weather Service at the strategic and operational levels. ¹⁰

Intelligence Preparation of the Battlefield (IPB) is the Army's doctrinal approach to providing environmental support to commanders. ¹¹ It integrates terrain and weather with a primary focus on the enemy, and secondary focus on friendly forces. The topographic engineer element of the theater topographic engineer battalion provides terrain analysis to include weather effects on the

terrain. The Air Force Staff Weather Officer provides predictive weather (meteorology and climatology), and weather effects for systems.¹² The IPB process is well defined at the tactical level of war, and will not be addressed in this paper. The Intelligence Center and School has begun a doctrinal look at operational level IPB which proposes environmental considerations for a campaign plan within the functions of theater area evaluation, analysis of the characteristics of the theater of operations, threat evaluation, and threat integration.¹³ Although one may infer an evolutionary leap from operational IPB to a strategic IPB (considering a theater of war), this remains doctrinally undefined except for the general considerations of strategic geography discussed in Chapter II.

The Army has several environmental initiatives in concept, organization, and technology. In the concept arena, the Army is forming a general officer steering group to address LTC Richard Johnson's "Battlefield Assessment" which proposes that the Engineer be the Army agent for developing knowledge of the physical battlefield with Army proponentcy for related doctrine, organizations and technologies, and support responsibilities to the intelligence community and the remaining Army elements.¹⁴ The field Army's primary environmental organizations, the theater engineer topographic battalions, are converting

throughout Fiscal Year 1988 to the L-Series Table of Organization and Equipment which expands terrain analysis capabilities in personnel and automated equipment. ¹⁵ The AirLand Battlefield Environment (ALBE) Thrust (an Engineer effort with Intelligence School proponentcy) provides an umbrella for emerging Army environmental technologies, while the All Source Analysis System (ASAS) (the Army component of the Joint Tactical Fusion Program) integrates terrain and weather through the Digital Topographic Support System (DTSS) and Integrated Meteorological System (IMETS). ¹⁶

THE NAVY

Under the Chief of Naval Operations, the Oceanographer of the Navy manages and coordinates the Navy Oceanography Program which encompasses meteorology, oceanography, hydrography (including MC&G), astronomy, and precise time and time interval. ¹⁷ The Naval Oceanography Program provides multidisciplined environmental information from the ocean floor into the atmosphere. The Naval Oceanographic Office is the largest single field element. ¹⁸ Hydrographic data collected by the Navy is provided to the Defense Mapping Agency which produces standard nautical charts ¹⁹

The Oceanographer of the Navy exercises staff supervision over

oceanographers, meteorologists, and MC&G staff personnel. The 1800 designator career program combines MC&G, meteorology, oceanography, gravity, and navigation magnetics into one field with a broad geoscience background, and it provides officers to the fleet and unified commands knowledgeable in integrating these skills with systems for naval air, surface and subsurface operations. ²⁰

THE MARINE CORPS

The Director of Intelligence has staff supervision over mapping, charting, and geodesy. The 2nd Topographic Platoon conducts near and in shore hydrographic surveys, topographic surveys, and terrain analysis. Meteorology is divided into support for aviation (supervised by the Deputy Chief of Staff for Aviation, with operational meteorology in aviation elements), and support for artillery (supervised by the Deputy for Plans, Policies, and Programs, with operational meteorology organic to artillery units). The Marine Corps is considering enlarging to three topographic platoons, one for each marine expeditionary force, and concentrating on terrain analysis in the Army style. ²¹

THE AIR FORCE

The Deputy Chief of Staff Operations supervises all environmental programs

with the exception of MC&G requirements which is under the Deputy Chief of Staff Intelligence. There is a strong emphasis on meteorology, with the Air Weather Service as the primary element supporting selected unified and specified commands (mainly non-naval operations), the Air Force , and the Army. Other environmental career fields, less MC&G, are mostly in the Air Force Systems Command. The only Air Force MC&G unit, the Geodetic Survey Squadron, is assigned to the Defense Mapping Agency. The Air Force is planning to merge its MC&G career area with intelligence to provide a broader career area and training integration.²²

THE DEFENSE MAPPING AGENCY

The Defense Mapping Agency (DMA) provides the full range of MC&G standard products, and product distribution along with program management and coordination of all Department of Defense MC&G activities. It also conducts joint training in MC&G.²³

DMA is pursuing a major reorientation of its products and services in order to incorporate digital terrain data. Military operations and system technology are demanding geographic information with greater positioning accuracy, increased feature description, broader data access, and quicker time response. Digital

terrain data bases are key developments to respond to these requirements at the strategic, operational, and tactical levels. They would provide information analogous to maps at one level of data, and then have sublevels of discrete data (such as road and waterway capacities), and integrated data (such as climatic effects on vegetation, and soils for mobility).²⁴

SUMMARY

Commanders at the strategic and operational levels of war are receiving a diverse range of environmentally related support. The concepts and organizations which provide this support are traditionally aligned by geographic disciplines within service (land, sea, air, space) orientations. Joint management of environmental services focuses on meteorology, oceanography, and space, and does not include topography. Mapping, charting, and geodesy have a distinct support structure outside of the current environmental program. There are independent service and joint attempts being made to integrate some elements of environmentally related support, primarily weather/terrain effects.

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6. Department of the Army, Field Manual 100-6, pp. A-1 to A-5.
7. Interview with Timothy Daley, LTC, Defense Mapping Agency, Washington, 19 November 1987.
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15. Interview with John Olesak, LTC, Office of the Deputy Chief of Staff, Intelligence, U.S. Department of the Army, Washington, 17 November 1987.
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18. U.S. Naval Oceanographic Office, Oceanography In Action, p.2.
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20. Interview with Frank Rossi, LCDR, Office of the Oceanographer of the Navy, Washington, 22 January, 1988.
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22. Interview with Dexter Armstrong, Lt. Col. , Office of the Assistant Chief of Staff Intelligence, U.S. Air Force, Washington, 9 February 1988.
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CHAPTER IV

WHAT IS THE PROBLEM?

Sound command organization should provide for unity of effort, centralized direction, decentralized execution, common doctrine, and interoperability. ¹ JCS Pub. 2

The problem is current environmental service concepts, organizations, and programs inadequately support the needs of commanders at the strategic and operational levels of war based on the aims of joint battle organization cited above.

Based on the commander's needs developed in Chapter II and the discussion of what is being provided in Chapter III, this chapter will address the problem cited above by presenting deficiencies in concept, organization, and programs.

CONCEPT DEFICIENCIES

Deficiencies in concept evolve from one judgemental error: treating the geographical elements of the battle environment, land-sea-air-space, and their associated geoscience disciplines (e.g. topography, oceanography, meteorology, astronomy) as functionally independent rather than interdependent. The

commander's decision making process is deluged with discrete hierarchies of environmental data without the benefit of decision aids to reveal or interact with their synergy. In land operations this could take the form of the physical merging of terrain and weather information as detected by a space system. Consider the simple example of mud (Napoleon called mud the fifth element of war), which is the synergy of soil and water (terrain and weather). The commander is concerned with its effects on friendly and enemy forces, not its composition. At sea, subsurface strategy and operations evolve from the synergy of such elements as ocean bottom terrain, water thermal, pressure and current conditions, surface climatology (ice), and space based navigation and communication. There is a battle environment parallel between ocean submarine and aerospace. Space expands the battle environment within itself (SDI), and relative to the other environments. Writing on the military uses of space, Colin Gray reminds national policy makers and commanders that:

Just as land, sea, and air warfare lack integrity as separate subjects for policy development and debate, so, space warfare can be approached sensibly only when its possibilities are integrated into broad defense policy. To be exploited properly, a new military instrument has to be considered with respect both to far reaching strategic and operational possibilities, and to its possible tactical merit for more efficient prosecution of conventional conflicts.²

Mapping, charting, and geodesy (MC&G) should not be separated from the commander's environmental concept. It is the dimensional canvas on which the battle environment is painted, textured, visualized, and communicated. MC&G is the decision aid medium supporting the commander's environmental concept, and must evolve to the dynamics of the decision, not impede it, or worse, dictate it.

The certainty and complexity of joint force strategic and operational decision making argues for a simple, yet encompassing environmental concept which is universally understood among commanders. Organization and programs would progress from it.

ORGANIZATION DEFICIENCIES

Currently, commanders at the strategic and operational levels must turn to a myriad of organizations for environmental information. Each organization may be dedicated to a particular environmental element, yet they more commonly overlap not only in support, but also demands on information sources (such as space based sensors). Commonality in information specification is rare, as are procedures for data management, analysis, and dissemination. A joint force commander must rely on single service oriented environmental organizations (such as Air Force or Naval meteorology) and their cooperative ability to address his need for integrated analysis across the spectrum of forces and environments

in his theater.

The present thrust for joint oversight and doctrinal development demanded in the Goldwater- Nichols Department of Defense Reorganization Act of 1986 clearly seeks a better way of providing support to the warfighting commanders-in-chief. The Defense Mapping Agency was studied (to my knowledge the only environmentally oriented defense agency since the Defense Intelligence Agency was exempted, and Service activities were not included). Recommendations (both applicable to all Combat Support Agencies and directed to DMA) commonly call for: better oversight by the Office, Secretary of Defense or the Organization of the Joint Chiefs of Staff (now Joint Staff); improved program visibility and representation; and, improved coordination with, and response to the combatant CINCs.³ One can make a reasonable assumption based on these recommendations and the diverse environmental support system - the combatant CINCs are not getting the best environmental support.

There is environmental support duplication between the Defense Intelligence Agency (DIA) and the Defense Mapping Agency (DMA). DIA produces an extensive range of environmental intelligence, such as strategic and regional appraisals which focus at the strategic and operational levels. The DIA geographic library has both published and one-of-a-kind studies. But DMA has responsibility for production of standard terrain analysis products, and the

cartographic aspects of geographic information ⁴

The Environmental Services Division of the Joint Staff has functional responsibility over the spectrum of environmental disciplines and support (discussed in Chapter III), but distances itself from integrating mapping, charting, and geodesy, and strategic terrain analysis. It limits itself to meteorology and oceanography, with a liaison to DMA.

The Air Force and Navy divide up meteorological support to the combatant CINCs. Cooperation provides each a major subordinate element dedicated to its own environmental focus. Yet, they engender competition for environmental information access, personnel, and research and development.

The organizational deficiencies cited above lead to inefficient duplication and incomplete analysis which complicates the integration of environmental support into the decision making process. In these resource constrained times, centralized direction and decentralized execution dictates the integration of producers to reduce overhead, and provide a focused application of decision aids. These decision aids must incorporate standardized processes, computer assisted artificial intelligence, linkage to acquisition sources, and integration-minded analysts who have a broad background in the environmental sciences to replace the present, laborious, technical assemblyline of organizations.

PROGRAM DEFICIENCIES

Program deficiencies emerge from the lack of a universally applied environmental concept, and the competition among the myriad of environmentally focused organizations, each purveying its institutional bias and clamoring for resources and user attention. Three collective areas of program deficiencies are doctrinal development, information technology, and personnel management.

Doctrinal Development

Joint environmental doctrine at the strategic and operational levels of war does not exist. Commanders must arbitrate between the competing biases of their supporting environmental organizations and the principle doctrines of their component forces. Where is the synthesis of environmental philosophies among defense agencies and the military services, and between the Department of Defense and other governmental agencies such as the Central Intelligence Agency, the National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA)? A joint doctrine is essential before combined doctrine can be developed. A combatant CINC must find his own compromise between the environmental analyses which support AirLand Battle Doctrine, the Maritime Strategy, and Aerospace Doctrine.

Information Technology

Advances in information technology which can greatly benefit environmental decision making by strategic and operational commanders, are being developed incoherently, if at all. The Joint Tactical Fusion Program is mainly focused at the tactical level (corps and below), but it is a shining example of what can be done to merge terrain and weather digital analysis into knowledge-based , decision aids. The diverse structures of environmental information data bases (rather than a common structure geographic information system), their inaccessibility (either due to classification, system incompatibility, data insulation rather than networking, or lack of awareness in their existence), and the failure to take advantage of the rapid evolution of information management technologies (evolution is a positive development but one which is worsened by competing requirements among defense elements and their independent acquisition programs), provide damning evidence that environmental support information programs are broken.

Personnel Management

Personnel management deficiencies stem from the functional focus of environmental support to either land, sea, air, or space forces, and its further

subordination within either operations or intelligence. Only the Navy has chosen to collectively access, train, and assign its environmental science officers. The Air Force and Army still succumb to environmental personnel hierarchies which perpetuate the inability to integrate not only their environmental analysts, but the analyst's analyses.

SUMMARY

Environmental support to commanders is hampered by deficiencies in concept, organization, and programs. These deficiencies argue for a universally understood and encompassing battle environment concept, stronger centralized direction which empowers decentralized execution, and coherent and resource effective programs.

ENDNOTES

1. Department of Defense, Unified Action of the Armed Forces, p. 3-2.
2. Colin S. Gray, American Military Space Policy: Information Systems, Weapon Systems and Arms Control, p. x.
3. John R. Vaughn, Defense Mapping Agency, letter, Subject: Recommendations of the Studies Performed Under the DoD Reorganization Act, 2 November 1987.
4. Interview with Timothy Daley, LTC, Defense Mapping Agency, 19 November 1987.

CHAPTER V

WHAT MORE CAN BE DONE?

Comprehensive and imaginative integration of U.S. and allied military capabilities is required to reduce risks to our national security ... U.S. military forces also must be supported by plans, doctrines, and command relationships which provide for effective integration and employment of all facets of our military power.¹

U.S. Defense Policy

What more can be done to provide environmental support to commanders at the strategic and operational levels of war? It is necessary to integrate the physical aspects of the battle environment under a unifying concept, centralize policy formulation and direction, provide an organizational structure, and integrate capabilities in personnel and programs. This chapter will present recommendations for each of these areas.

THE BATTLE ENVIRONMENT ASSESSMENT CONCEPT

The Battle Environment Assessment is an overarching concept of conveying to the commander the synergistic effects on his strategy and operations from the integration of the land, sea, air and space environments. It offers a simple, unifying frame of reference to assimilate the broad spectrum of environmental

sciences, and focus them on the multidimensional character of the theater of war or operations. Analyzing this multidimensional frame of reference, the commander can formulate strategy and operations maximizing the multidimensional capabilities of his forces, and impeding the enemy's forces.

The following figures illustrate the physical zones and interrelationships of the Battle Environment Assessment. Figure 1, The Battle Environment, shows the continuum of each zone - land, sea, air, and space - and illustrates the basic concept. Figure 2 shows the zonal intersects. Figures 3 and 4 show the intersects of three zones. Figure 5 lists the four basic zones and the eleven intersect variations. Military strategy and operations occur in these zones and intersects which may be viewed either at an instant of time, or over a period of time.

A commander must resist the traditional interpretation that strategy is only associated with the zones, and operations with the intersects. He must stand back from this narrow perspective and grasp the "big picture" in a sense of place. The continuum concept of the Battle Environment Assessment permits the commander to integrate a sea-land-air-space strategy. For example, SeaLand (submarine) operations is an environmental parallel to AirLand operations (Figure 2). Amphibious operations occur within the Sea-Air-Land environment (Figure 3). A Sea Launched Cruise Missile would operate in the environments illustrated by

movement from Sea (launch), along the SeaAir to AirLand intersects, to Land (impact) (Figure 2). A complete Battle Environment Assessment would assess each of these zones and intersects, their interrelationships, movements within or along them, and the appropriate period of time.

Within the Battle Environment Assessment concept it is easy to appreciate the integration of digital terrain, meteorologic, oceanographic, and space information requirements for near-real-time analyses, and data bases built with levels of sophistication on common positional references. By setting aside the traditional sea-land-air-space bias in favor of an integrated analysis, both the commander and his environmental support structure can pursue collective organizational and program developments.

The Battle Environment Analysis is a simple, unifying concept. It should replace the present terrain and weather, or geography and weather analyses used in the campaign plan (Appendix 4), and the situation portion of estimates and plans.

THE BATTLE ENVIRONMENT
Concept Illustration



FIGURE 1

BATTLE ENVIRONMENT

Zones and Intersects

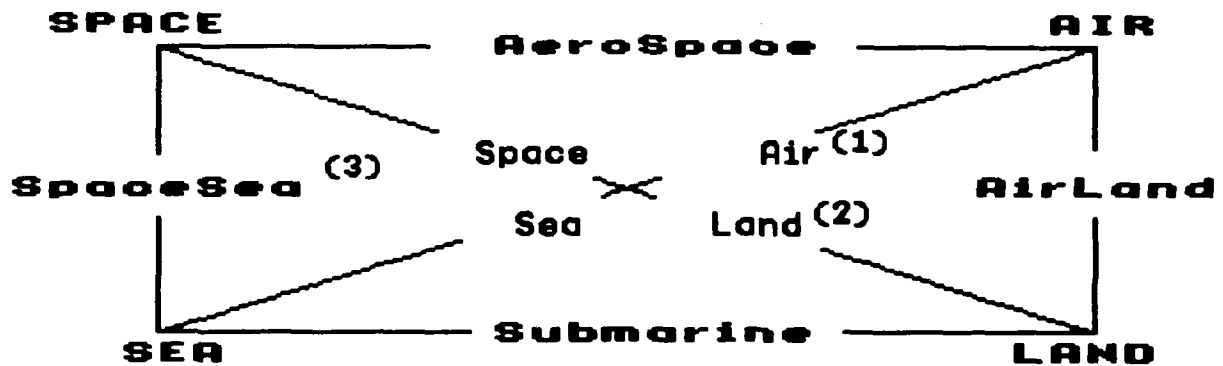


FIGURE 2

- (1) **SeaAir:** Two perspectives are the sea-air surface, and air over sea.
- (2) **SpaceLand:** Conceptually where there is no atmosphere, e.g. lunar.
- (3) **SpaceSea:** Difficult to appreciate on Earth, but consider another world where a liquid state of matter interacts with the void of space.

BATTLE ENVIRONMENT
Three Zone Intersects (A)

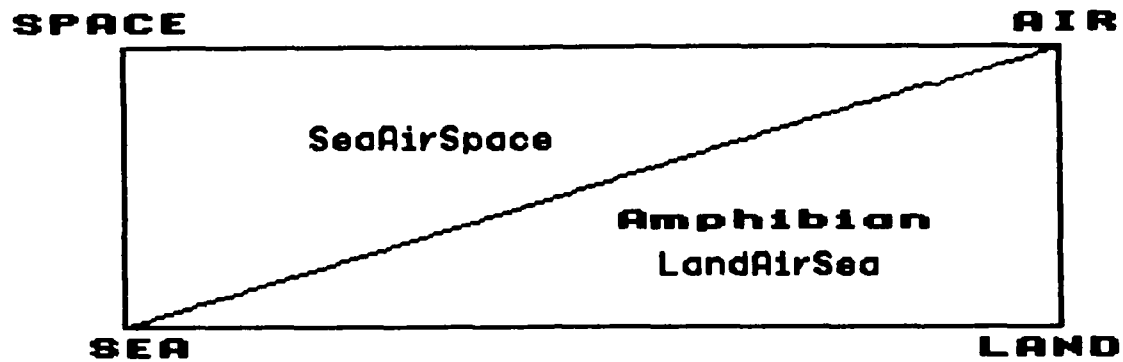


FIGURE 3

1. Within Zones example : Amphibian is within Sea-Air-Land.
2. Along Zone Intersects example : Sea Launched Cruise Missile is SeaAir to AirLand.

BATTLE ENVIRONMENT
Three Zone Intersects (B)

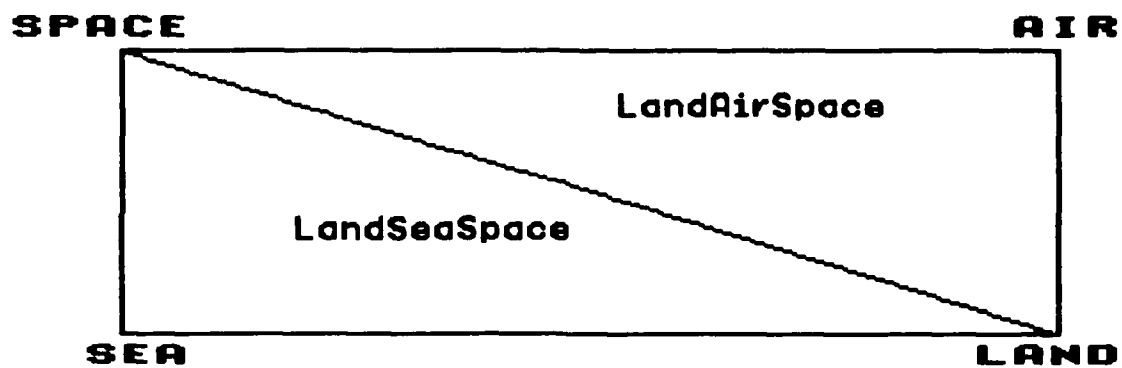


FIGURE 4

BATTLE ENVIRONMENT
Total Dimensions

(Refer to FIGURE 2)

<u>SINGLE ZONE</u>	SPACE	AIR
	SEA	LAND
<u>TWO ZONE INTERCEPT S</u>	AirLand	SeaLand (Submarine)
	SpaceLand	SeaSpace
	SeaAir	AirSpace (AeroSpace)
<u>THREE ZONE INTERCEPTS</u>	LandAirSea	SeaAirSpace
	LandAirSpace	LandSeaSpace
<u>FOUR ZONE INTERCEPT</u>	LandAirSpaceSea	

FIGURE 5

POLICY FORMULATION AND DIRECTION

The Environmental Services Division of the Director of Operations (J3), Joint Staff should pursue a fully integrated environmental mission to formulate and coordinate policy, and provide direction and oversight of battle environment support to the unified and specified commands. It should be staffed with officers trained to apply the Battle Environment Assessment concept in joint strategy and operations , and who function in a broadly integrated, knowledge-based style of matrix management.

DEFENSE ENVIRONMENTAL AGENCY

The Defense Environmental Agency would be established to provide an organizational structure to support the battle environment requirements of the Chairman of the Joint Chiefs of Staff, the Joint Staff, unified and specified commands, the military services, and other Department of Defense agencies. All defense agencies engaged in environmental science activities, including the Defense Mapping Agency and the strategic geographic intelligence elements of the Defense Intelligence Agency, would be assigned to it. The Agency would provide operational support as a combat support agency, be the DoD Environmental Support Program Manager, and execute the personnel management of Joint Battle

Environment Assessment Officers to include their accession, training, and assignment within joint activities and the unified and specified commands. Its commander would be an O9 who would be a special staff officer of the Chairman, Joint Chiefs of Staff. The Assistant Secretary of Defense for Command, Control, Communications, and Intelligence would provide operational oversight, and the Undersecretary of Defense for Research and Engineering would provide oversight of the agency's Environmental Research Program.

ENVIRONMENTAL SUPPORT CAPABILITY INTEGRATION

As the DoD Program Manager for Environmental Support, the Defense Environmental Agency would coordinate the battle environmentally related activities of the Military Services, and be the DoD executive agent for both U.S. governmental activities engaged in environmental actions (such as NOAA, NASA, and the Environmental Protection Agency), and international defense activities (such as NATO standardization groups). Executive agent responsibilities could be decentralized to operational elements of the agency such as DMA for MC&G, weather to a newly formed Defense Meteorology Agency, and oceanography to a Defense Oceanographic Agency. The military services might also be delegated responsibilities such as the current Army status as DoD Executive Agent for water resources (an excellent model for assessing the benefits of consolidating

and coordinating a sub element of the battle environment)

SUMMARY

Recommendations to resolve environmental support deficiencies to commanders at the strategic and operational levels of war include the Battle Environment Assessment concept, centralization of policy formulation and direction in the Environmental Services Division of the J3, Joint Staff, the formation of the Defense Environmental Agency to provide operational support and program management, and integration and coordination of the total Department of Defense environmental capabilities.

ENDNOTE

1. The White House, National Security Strategy of the United States, p. 19.

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APPENDIX I

GLOSSARY

AirLand Battle -- The US Army's basic fighting doctrine. (FM 100-5)

Aerospace -- Of or pertaining to, earth's envelope of atmosphere and the space above it, two separate entities considered as a single realm for activity in launching, guidance, and control of vehicles that will travel in both entities. (JCS Pub 1)

Astronomy -- The science which treats of the celestial bodies, their magnitudes, motions, constitution, etc. (Webster)

Battle Environment Assessment -- An overarching concept of conveying to the commander the synergistic effects on his strategy and operations from the integration of the land, sea, air and space environments. (Airbv)

Cartography -- The art and science of expressing graphically, by maps and charts, the known physical features of the Earth, or of another celestial body, usually includes the works of man and his varied activities. (DMA)

CINC -- Commander in Chief of a unified or specified combatant command. (JCS Pub 2)

Climatology -- The science which treats of climates and their phenomena. (Webster)

Concept -- A notion or statement of an idea, expressing how something might be done or accomplished, that may lead to an accepted procedure. (JCS Pub 1)

Doctrine -- Fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgement in application. (JCS Pub 1)

Geodesy -- The science which deals with the determination of the size and figure of the Earth, and which derives three dimensional positions for points above, on, and below the surface of the Earth. (DMA)

Hydrology -- Deals with the properties, laws, and phenomena of water, of its physical, chemical, and physiological relations, of its distribution throughout the habitable Earth, and of the effect of its circulation on human lives and interests. (DMA)

Intelligence Preparation of the Battlefield -- A systematic and continuous process of analyzing the enemy, weather, and terrain in a specific geographic area. (FM 34-1)

Levels of War -- Three levels of war: strategic, operational, and tactical. (FM 101-5)

Marine Expeditionary Force -- The largest of the US Marine air-ground task forces, normally built around a division/wing team, but can include several divisions and aircraft wings together with an appropriate combat service support organization (previously a marine amphibious force). (JCS Pub 1)

Maritime Strategy -- The maritime component of the US national military strategy; it offers a global perspective to operational commanders and provides a foundation for advice to the US National Command Authorities (US Maritime Strategy)

MC&G (Mapping, Charting, and Geodesy) -- The collection, transformation, generation, dissemination, and storing of geodetic, geomagnetic, gravimetric, aeronautical topographic, hydrographic, cultural, and toponymic data which may be used for military planning, training, and operations; includes the evaluation of topographic, hydrographic, or aeronautical features for their effect on military operations or intelligence. (DMA)

Meteorology -- The science treating the atmosphere and its phenomena (Webster)

Military Geography -- The specialized field of geography dealing with natural and man-made physical features that may affect the planning and conduct of military operations. (JCS Pub 1)

Military Services -- A branch of the Armed Forces of the US, the US Army, US Navy, US Air Force, US Marine Corps, and US Coast Guard. (JCS Pub 1)

Oceanography -- The study of the sea, embracing and integrating all knowledge pertaining to the sea and its physical boundaries, the chemistry and physics of seawater, and marine biology. (JCS Pub 1)

Operational Level of War (Operational Art) -- The employment of military forces to attain strategic goals in a theater of war or theater of operations through the design, organization, and conduct of campaigns and major operations. (FM 100-5)

Physical Geography -- Geography which treats of the exterior physical features and changes of the Earth. (Webster)

Strategic Level of War (Military Strategy) -- That level of war which employs the armed forces of a nation or alliance to secure policy objectives by the application or threat of force, sets fundamental conditions of operations in war or to deter war, establishes goals in theaters of war and theaters of operations, and assigns forces, provides assets, and imposes conditions on the use of force. (FM 100-5)

Tactical Level of War (Tactics) -- That level of war by which corps and smaller unit commanders translate potential combat power into victorious battles and engagements. (FM 100-5)

Terrain Analysis (Terrain Study) -- An analysis and interpretation of natural and man-made features of an area, their effects on military operations, and the effect of weather and climate on these features. (JCS Pub 1)

Theater of Operations (Area of Operations) -- That portion of an area of war necessary for military operations and for the administration of such operations. (JCS Pub 1)

Theater of War (Area of War) -- That area of land, sea, and air which is, or may become, directly involved in the operations of war. (JCS Pub 1)

TO&E (Table of Organization and Equipment) (Establishment) -- The table setting out the authorized numbers of men and major equipment in a unit/formations. (JCS Pub 1)

Topography -- The configuration of the surface of the Earth, the science of delineation of natural and man-made features of a place or region especially in a way to show their positions and elevations, in oceanography, a surface such as the sea bottom or a surface of given characteristics within the water mass. (JCS Pub 1)

APPENDIX 2

ENVIRONMENTAL RESPONSIBILITIES
(Extract of JCS Pub 2)

SECTION XI, MAPPING, CHARTING, AND GEODESY

4-77. General

a. Purpose. The purpose of this section is to set forth the broad responsibilities for guidance of the Defense Mapping Agency (DMA), the Military Departments, and the CINCs in fulfilling DOD-wide requirements for mapping, charting, and geodesy (MC&G).

b. Principles Governing Production and Distribution. The DMA is responsible for providing a broad spectrum of MC&G products and services to support operations essential to the national security of the United States. This support includes the production and distribution of MC&G data and products essential for military operations, planning, and training missions and support of other DOD activities. The DMA provides program management and coordination of all DOD MC&G resources and activities in developing an MC&G program responsive to overall requirements and priorities established in support of the Joint Chiefs of Staff.

4-78. Scope

a. MC&G. MC&G includes, in addition to the production of maps and charts, the following activities: (1) geodetic surveys for control, target positioning, and related purposes; gravity, geomagnetic, and hydrographic data; cartographic, photogrammetric, and digital data; (2) satellite geodesy; (3) geographic name indexing; (4) cartographic phases of area analysis intelligence production; (5) terrain and ocean bottom model production; and (6) evaluation of source material and products.

b. Related Data. Related data include MC&G source materials required for production of: (1) maps, charts, and geodetic and geophysical data; (2) air and sea navigation publications and information services; (3) terrain and ocean bottom models; (4) gazetteers; (5) target materials; (6) graphics for support of special forces activities; (7) materials for support of weapon systems and navigation systems; (8) digitized terrain and feature data; (9) air weather charts; and (10) geodetic and geophysical models and data for weapon systems; and (11) LANDSAT data and imagery.

4-79. Responsibilities of the Chairman, Joint Chiefs of Staff

a. To advise the Secretary of Defense on MC&G requirements and priorities.

b. To provide guidance to DMA and the unified and specified commands to serve as the basis for inter-relationships between these organizations.

c. To obtain advice and recommendations from the Director, DMA, on matters within his area of responsibility.

4-80. Responsibilities of the Defense Mapping Agency

a. To organize, direct, and manage the DMA and all resources assigned to DMA.

b. To serve as Program Manager and Coordinator of all DOD MC&G resources and activities. This includes review of the execution of all DOD plans, programs, and policies for MC&G activities not assigned to DMA.

- c. To provide staff advice and assistance on MC&G matters to the Secretary of Defense, the Military Departments, the Joint Chiefs of Staff, other DOD components, and other government agencies, as appropriate.
- d. To develop an MC&G program for review by the Joint Chiefs of Staff and approval by the Secretary of Defense, using established Planning, Programming, and Budgeting System procedures.
- e. In support of the Joint Chiefs of Staff, to review requirements and priorities and to develop a consolidated statement of MC&G requirements and priorities.
- f. To ensure responsive support to the MC&G requirements of the Military Departments and the unified and specified commands.
- g. To establish policies and provide DOD participation in national and international MC&G activities in coordination with the Assistant Secretary of Defense (International Security Affairs), the Secretaries of the Military Departments, and the CINCs; to execute DOD responsibilities under interagency and international MC&G agreements.
- h. To establish DOD MC&G data collection requirements; to collect or task other DOD components to collect and provide necessary data.
- i. To establish DOD MC&G RDT&E requirements in coordination with the Assistant Secretary of Defense (C3I) and the Secretaries of the Military Departments; to task other DOD components or private contractors to accomplish such requirements.
- j. To carry out the statutory responsibilities for providing national charts and marine navigation data for the use of all vessels of the United States and of navigators generally.
- k. To provide distribution of MC&G data and products to the Military Departments and the unified and specified commands.
- l. To operate a school system responsive to the requirements of the Services for training of DOD civilian and military personnel in MC&G skills.

m. To maintain MC&G source data libraries of materials and provide services on such data to all DOD activities.

n. To ensure that the Joint Chiefs of Staff, the Military Departments, and appropriate OSD staff elements are kept fully informed of DMA activities of concern to them.

4-81. Responsibilities of the Military Departments

a. To develop and submit to DMA their MC&G requirements and priorities.

b. To provide support, within their fields of responsibility, to the Director, DMA, as required to carry out the assigned mission of the agency.

c. To assess the responsiveness of DMA to their operational needs.

d. To provide DMA their recommendations on MC&G products and the content of international standardization agreements.

e. To coordinate with the Director, DMA, all MC&G-related programs and activities.

f. To provide members of the DOD MC&G Programs and Requirements Review Group.

g. To identify to DMA those MC&G production capabilities of their departments that are available to satisfy DOD-wide requirements after satisfying departmental command and departmental MC&G requirements, and to conduct those MC&G programs and activities assigned by the DMA to utilize the identified additional capabilities.

4-82. Responsibilities of the Unified and Specified Commands

a. To develop and submit to DMA their MC&G requirements and priorities.

b. To provide support, within their fields of responsibility, to the Director, DMA, as required to carry out the assigned mission of the agency.

c. To assess the responsiveness of the DMA to their operational needs.

d. To maintain within their headquarters the staff capability to direct the MC&G activities of their command.

e. To satisfy, insofar as practicable, their approved MC&G requirements from assigned resources.

f. To coordinate with the Director, DMA, all MC&G-related programs and activities.

g. To identify to DMA those MC&G production capabilities of their commands that are available to satisfy DOD-wide requirements after satisfying command MC&G requirements, and to conduct those MC&G programs and activities assigned by the DMA to utilize the identified additional capabilities.

h. To maintain, within the limits of available resources, constant research for source materials for maps and charts and to furnish copies to the appropriate libraries of DMA.

SECTION XIII, METEOROLOGICAL, OCEANOGRAPHIC,
AND SPACE ENVIRONMENTAL FACTORS

4-89. Purpose. The purpose of this section is to set forth the principles, doctrine, functions, responsibilities, and organizations for providing meteorological, oceanographic, and space environmental support to the unified and specified commands, other joint activities of the Armed Forces, and the Military Services.

4-90. Basic Principles

a. The deployment, employment, and logistics of forces are affected by meteorological and oceanographic conditions.

b. When determining how best to perform a mission, a commander should consider the meteorological factors

and, where appropriate, the oceanographic and space environmental factors involved and should employ pertinent support services as an integral part in strategic and tactical planning operations.

c. Meteorological and oceanographic data are highly perishable; the usefulness of observations and forecasts diminishes rapidly because of the constantly changing state of the air-ocean-space environment.

d. Effective meteorological and oceanographic services require effective communications support.

4-91. Doctrine

a. The National Oceanic and Atmospheric Administration and the foreign national meteorological and oceanographic services are responsible for providing the basic observation network, the basic broad-scale analyses and prognoses, and the related facilities within their national areas of responsibility. Any use of hemispheric analyses in support of commands conducting worldwide military operations automatically presupposes interdependence among nations for meteorological and oceanographic services.

b. The US military meteorological and oceanographic services are worldwide specialized services, organized to satisfy unique military requirements. Meteorological support to a mobile field army and to an air strike force, meteorological and oceanographic support to a Navy carrier task force, and space environmental support to DOD space operations and worldwide communications are examples of the unique, specialized service provided by the military environmental services.

4-92. Functions and Responsibilities

a. Specific Responsibilities

(1) The Chief of Naval Operations, through the Commander, Naval Oceanography Command, is responsible for the provision of meteorological support to all elements of the Navy and for oceanographic support to all elements of the Department of Defense.

(2) The Chief of Staff, US Air Force, through the Commander, Air Weather Service, is responsible for

provision of meteorological and space environmental support to all elements of the Air Force and for meteorological support to all Army units by joint agreement.

(3) The Chief of Staff, US Army, through the Assistant Chief of Staff for Intelligence, is responsible for interpretation of environmental products in support of Army Intelligence Preparation of the Battlefield, artillery fire, meteorological observations forward of division headquarters elements, river stage and flood forecasting, and for other special support the Army can most effectively or efficiently provide for itself.

(4) The Commandant of the Marine Corps is responsible for meteorological support for Marine artillery fire, Marine aviation, meteorological observation forward of division headquarters elements, and other special support the Marine Corps can most effectively and efficiently provide for itself.

(5) The Director, DMA, is responsible for mapping, charting, and geodesy support for environmental services.

b. In discharging their environmental responsibilities, the individual Services will accomplish the following:

(1) Provide the training, personnel, equipment, and supplies needed for meteorological and oceanographic support in response to operational requirements.

(2) Plan for the expansion of peacetime meteorological and oceanographic facilities to meet emergency or wartime needs in coordination with appropriate authorities.

(3) Organize and train personnel needed for meteorological and oceanographic support of joint operations, providing personnel and equipment for these operations, as required.

(4) Assist one another in the accomplishment of meteorological and oceanographic functions, as determined by proper authority.

(5) Provide, operate, and maintain the meteorological and oceanographic facilities organic to their own combat organizations.

(6) Guide the development of the personnel and materiel required for those operations for which the Service has been assigned specific responsibility.

c. In joint operations, the meteorological and oceanographic responsibilities of the individual Services are determined by the following:

(1) The nature of the joint operations.

(2) The Service or Services which provide the forces employed.

(3) The directives of the CINCs, of the subordinate unified commands, or of other joint force commanders.

4-93. Organizations for Providing Meteorological Oceanographic, and Space Environmental Support

a. Operational forces normally have meteorological and oceanographic services organic to the forces being employed in accordance with assigned Service procedures.

b. Staff meteorological and oceanographic support to the CINCs is a responsibility of the the Military Services as determined by the Joint Chiefs of Staff. Service responsibility is assigned as follows:

CINCAD	Air Force
USCINCLANT	Navy
USCINCCENT	Air Force
USCINCEUR	Air Force
CINCMAC	Air Force
USCINCPAC	Navy
USCINCREC	Air Force
USCINCSO	Air Force
USCINCSpace	Air Force
CINCSAC	Air Force

c. Meteorological and space environmental support to the Joint Chiefs of Staff and Alternate National Military Command Center is a responsibility of the Air Force in accordance with current directives of the Joint Chiefs of Staff.

d. Oceanographic support to the Joint Chiefs of Staff and Alternate National Military Command Center is a responsibility of the Navy in accordance with current directives of the Joint Chiefs of Staff.

e. Meteorological and oceanographic support requirements of specialized DOD agencies are a responsibility of the Military Services, as determined by the Chairman, Joint Chiefs of Staff.

APPENDIX 3

ENVIRONMENTAL SERVICES DIVISION
(Extract of JCS Pub 4)

ENVIRONMENTAL SERVICES DIVISION (ESD)

Mission: The Chief, Environmental Services Division, is charged by the Director for Operations with the responsibility to take staff action concerning appropriate DOD environmental services; serving as the principal Joint Staff agency for all matters related to appropriate DOD environmental services plans and programs, which impact on the interests of the Department of Defense.

Functions:

1. Provide environmental services planning guidance to the unified and specified commands.
2. Review plans of the unified and specified commands to insure the adequacy of environmental services planning.
3. Evaluate the environmental services implications of the various plans which comprise the Joint Strategic Planning System (JSPS). Develop, staff, and submit environmental services inputs to the system as required.
4. Review plans and programs of the Military Departments to insure that adequate environmental services capabilities exist and are operationally employed.
5. Provide Joint Staff coordination, review, and policy recommendations concerning appropriate environmental services and, when directed, take appropriate action in areas for which a Service or Defense agency has primary responsibility.
6. Provide the OJCS focal point for space-related environmental support requirements and programs. Provide a focal point within the OJCS for meteorological and oceanographic matters. Provide a direct point of contact with the NMCC to insure the adequacy and timeliness of environmental support.
7. Provide staff assistance, as requested, for satisfying environmental services requirement by the Under Secretary of Defense for Research and Engineering (USDRE).

8. Provide staff environmental services to the Joint Chiefs of Staff, as directed.

9. Maintain direct liaison with external agencies for environmental services matters.

10. Develop and coordinate the DOD position for, and provide for US representation to, designated international committees and working groups, including those of military treaty organizations which are concerned with meteorological and oceanographic services policy and programs.

11. Develop and coordinate the DOD position for, and provide for US representation to, designated interagency committees concerned with meteorological and oceanographic services and policy and programs. This includes operational matters under consideration by the Office of the Federal Coordinator for Meteorological Services and Supporting Research.

12. Coordinate with DMA, maintaining liaison and an awareness of the products and capabilities of DMA in mapping, charting, and geodesy as they apply to terrestrial environmental affairs.

APPENDIX 4

CAMPAIGN PLAN
(Extract of FM 100-6)

APPENDIX A

Campaign Plan Format

(SECURITY CLASSIFICATION)

Copy No _____

Issuing Headquarters

Place of Issue

Date/Time Group of Signature

CAMPAIGN PLAN: (Number or Code Name)

Reference: Maps, charts, and other relevant documents

TASK ORGANIZATION. Refer to appropriate TPFDD.

1. SITUATION.

a. Enemy Forces. Provide a summary of pertinent intelligence data including information on the following:

- (1) Composition, location, disposition, movements, and strengths of enemy forces.
- (2) Most probable course of action.
- (3) Major objectives.
- (4) Commander's idiosyncrasies and doctrinal patterns.
- (5) Operational and sustainment capabilities.
- (6) Vulnerabilities and culminating points.
- (7) Centers of gravity.

Assumed information should be identified as such. References may be made to the intelligence annex for more detailed information to include a discussion of geography and weather.

END

DATE

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JULY 88